REMARKS

Applicant's counsel thanks the Examiner for the careful consideration given the Application. The following amendments have been made.

In the Specification

The paragraph starting on page 2, line 10 has been amended to correct the spacing between the terms "integration stage".

In the paragraphs starting on page 11, line 17 and page 12, line 3 the term "t_{INT}" has been corrected to correspond to the term as it appears in the drawings on figure 9.

In the Drawings

All of the figures in the drawings are being replaced in order to darken the lines and render them more reproducible. No changes to the drawings have been made other then as indicated below.

On Figure 1, reference number 105, which does not appear in the specification, has been deleted and the reference letters "A" and "B", which are referred to in the specification have been added.

On Figure 9, the time periods t_{RESET}, t_{READ}, t_{ROW}, and t_{HB} have been labeled as suggested by the Examiner. No new subject matter has been added.

In the claims

The Examiner indicated that claim 5 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 1 has been amended to include the limitations of original claim 1, intervening dependent claim 4 and dependent claim 5. Claims 2, 3, 6 and 7 are directly or indirectly dependent on amended claim 1. It is therefore respectfully submitted that present claims 1, 2, 3, 6 and 7 are allowable.

Claims 10 and 11 (which were originally amended via preliminary amendment) have been amended to render them dependent on independent claim 9; claims 18 and 19 (originally submitted via preliminary amendment), which include the limitations of claims 10 and 11, have been amended to be dependent on independent claim 8.

The Examiner rejected claims 8 to 17 under 35 U.S.C. 103(a) over the admitted prior art and in view of Guidash (US 6,218,656). This rejection is respectfully traversed.

The present invention as defined by independent apparatus claims 8, 9 and 12 are directed to a novel apparatus for performing a rolling shutter read sequence using double sampling on an array of active pixel sensors, without significantly adding to the complexity of the control circuitry, or adding another layer of addressing. The reading method in accordance with the present invention, as stated on page 11, line 17 to page 12, line 10 of the description, consists of resetting a selected row of pixels, allowing the pixels to integrate over time, reading the pixel information and then performing a secondary reset during the read time. The timing of this sequence can be sensitive to variations in integration time, and so the key of this invention is to tie the timing of the second reset to the activation of the row access signal. The apparatus for performing this read in accordance with the present invention is illustrated in figures 7 and 8 of the present specification, which shows the control circuitry that will accommodate the variations in integration time. The functional relationship between the row access signal activation and secondary reset activation, allows one to vary the integration time of the

image sensor without having to be concerned about creating overlapping reset sequences.

It is noted that Guidash (US Patent 6,218,656) is also directed towards performing a rolling-shutter read sequence using double sampling on an array of active pixel sensors. However, Guidash describes a pixel architecture wherein the gate of the preceding reset transistor acts as the voltage supply for the current reset transistor. Furthermore, the transfer gate is placed between the photodiode and the floating diffusion. This is illustrated in figures 1, 2, and 3.

The performance of a double-sample read is accomplished by activating the gate of the preceding reset transistor, then activating the current reset transistor, see figure 3 and col. 3, lines 45-50. This resets the current floating diffusion region. Subsequently, as the floating diffusion region is actively connected to the source-follower transistor this signal level is placed on the column output signal bus, sampling is accomplished by activation of the "SHR" or sample and hold reset transistor, see col. 3, lines 50-54. After the period of the integration time the transfer gate is activated and signal level of the photodiode region is transferred to the floating diffusion region, where it is then placed on the column output signal bus and then sampled using the "SHS" or sample and hold signal transistor, see col. 3, lines 57-64.

Subsequently, as the current reset transistor no longer has a power supply the transistor is activated again to put a low potential on the floating diffusion region, effectively "de-selecting" the row, see col. 3, line 65 to col. 4, line 4. Then the gate of the current reset transistor is activated again, to allow a voltage supply for the next reset transistor, see col. 4 lines 4 – 1.

As such there are a number of differences between Guidash and the present invention:

1) Guidash fails to teach how two distinct rows can be reset substantially simultaneously for different lengths of time. This would seem to imply a level of complexity in the control circuitry, as it would require a second set of addresses, that is not present in the present invention.

2) Guidash teaches a specific pixel architecture, and method of utilizing it to accomplish the rolling-shutter double-sample read, see Guidash, - figures 1 and 2. The method demonstrated will only work on the pixel architecture described. The present invention, is far more robust, and would be useable on other pixel architecture with minor modification.

3) The second reset for Guidash occurs during the second row read, see Guidash - figure 3, not during the read of the present row as in the present invention as shown in figure 9 of the present specification.

4) Guidash fails to teach or infer an apparatus having a double sample control circuit as defined by present independent claims 8, 9 and 12, the teachings of Guidash deal entirely with the pixel architecture and the timings of the activation of said pixel.

5) Guidash fails to teach or infer the key aspect of the present invention, tying the activation of the second reset signal to the row activation signal, which is carried out by the double sample control circuit in the present apparatus as defined in independent claims 8, 9, and 12.

In view of the above, it is respectfully submitted that apparatus as defined by claims 8, 9 and 12 is not taught applicant's admitted prior art in view of Guidash and therefore are patentable over applicant's admitted prior art in view of Guidash The Examiner is therefore respectfully requested to withdraw his rejection of claims 8, 9 and 12 under USC 103(a).

Further since claims 10, 11 and 13-19 are directly or indirectly dependent on one of the independent claims 8, 9 and 12, it is respectfully

submitted that these claims are also patentable over applicant's admitted prior art in view of Guidash, and the Examiner is therefore respectfully requested to withdraw his rejection of these claims under USC 103(a).

The Examiner further made US Patent 6,410,899 – Merrill et al and US Patent 6,624,850 – Guidash of record. Applicant respectfully submits that neither of these references teach or infer the method defined by claims 1, 2, 3, 6, and 7 or the apparatus defined by claims 8-19.

Conclusion

In view of the above amendments and remarks, and having dealt with all of the matters raised by the Examiner, Applicant respectfully requests a Notice of Allowance be issued in this case.

Applicants' counsel remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this application.

If any further fees are required by this communication, please charge such fees to our Deposit Account No. 16-0820, Order No. 33981US1.

Respectfully Submitted,

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Amendments to the Drawings

The attached 7 sheets of drawings include changes to Figures 1-9. These sheets replace the original 5 sheets including Figures 1-9.

Attachment: 7 Replacement Sheets Containing Figures 1-9